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Adolescent Impulsivity and Self-Instruction Training: A Pilot Study

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ADOLESCENT IMPULSIVITY AND SELF-INSTRUCTION TRAINING: A PILOT STUDY

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Foreword

At present there exists very little literature or research dealing with impulsive behaviour in adolescents and ways of modifying it. This pilot study therefore serves a double purpose: it contains a useful review of existing literature on the subject and it provides an evaluation of the effectiveness of self-instruction training with high-risk adolescents.

The pilot program will be of interest to those working in the field of impulsivity in adolescents for its use of two innovations: self-instruction training and videotape feedback. Videotape feedback, which was previously generally limited to teacher education, was used to help high-risk students improve their attention span and their recall.

In addition, the study confirmed the accuracy of the Matching Familiar Figures test (MFF) in the identification of the most highly impulsive adolescents.

Although the study seemed to prove the efficacy of self-instruction training as an approach to behaviour modification in impulsive adolescents, it should be remembered that the pilot program was conducted on a very limited basis. To further test the efficacy of these techniques, the procedures will have to be repeated with a greater number of subjects.

C. Michalski

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Abstract

An extensive literature review provided evidence of a strong link between impulsive thinking styles and forms of delinquency and other maladaptive behaviour. Cognitive impulsivity results in a reluctance or an inability to gather and act on information effectively in ambiguous problem situations -- that is, problems for which there are no clear-cut solutions. Impulsive persons may fail to consider choices and their consequences or correctness, and therefore may act quickly with a first available response. Further evidence suggests that such behaviour can be modified by approaches which are generally characterized by the term "cognitive behaviour modification". Self-instruction training, among other approaches to cognitive behaviour modification, has been applied with encouraging results. Persons are placed in problem-solving situations and are asked to verbalize their thinking processes, thus making their mediating activity overt. New strategies are taught which are intended to either modify or replace ineffective strategies.

From a co-operative education class in an urban high school, 16 adolescent ($\bar{x}$ age = 17.2 years) males were identified as impulsive and at high risk. Identification was based on performance on the Matching Familiar Figures test and on the advice of their teachers and counsellors. The students were randomly assigned to either an Experimental, Attention Control, or Control group for the duration of the study. It was predicted that those students who received self-instruction training in the Experimental group would be judged less impulsive in their classroom performance than students in the Attention Control and Control groups.

Students participated in 12 to 15 group problem-solving sessions (20-25 minutes in length) over a period of four months. Each session was videotaped. Those students assigned to the Experimental group individually received self-instruction

training within 24 hours of each problem-solving session. Instruction included videotape feedback and application of thinking strategies to the problem being reviewed. Those in the Attention Control group viewed the videotapes of their sessions but did not receive self-instruction training. Control students received neither feedback nor training.

During the course of the study, seven of the students either left or were expelled from the school, leaving two students in the Experimental group, four in the Attention Control group, and three in the Control group. This attrition precluded any attempt at generalizations from the results.

Two dependent measures of change in impulsive behaviour were in the predicted direction. Using a 15-item self-control rating scale, two in-class teachers agreed in their observations that students in the Experimental group decreased their impulsive behaviour compared to the Attention Control and Control groups. Teachers were not aware of group assignments. The second dependent measure consisted of viewings by two naive judges of videotapes of four problem-solving sessions involving each student from each month of the study. The judges recorded the frequency of impulsive behaviours in five categories. The judges' observations were also in agreement and in the predicted direction.

The study provided limited support for the efficacy of self-instruction training in the classroom for reducing cognitive impulsivity. A number of recommendations were made for future study. Primary among these were recommendations which may lend credibility and practicality to self-instruction training in an ongoing classroom setting. They were 1) embedding the training sessions within the curriculum and 2) conducting training sessions in groups rather than individually.

Introduction

Background

The problems posed for individuals and society by highly impulsive children and young adults are not insignificant. Such children rob themselves, their parents, and the community of many of the reciprocal benefits each provides for the other. Impulsive students may not attend well to their school curriculum and thereby deny themselves opportunities available to their better-educated peers; they may cause moments of intolerable frustration for parents, teachers, and other supervising adults who cope in ways that may only aggravate a child's misbehaviour; and for varying periods of their youth and adulthood, they may become a liability to the community because of the need for placements in special and costly settings (e.g., special education classes, court homes, training schools, etc.).

It has been estimated that 30 per cent of the school age population display impulsive characteristics to the extent that functional ability is to some degree impaired (Margolis et al., 1977). In Ontario, according to 1977 statistics, approximately 5700 elementary and secondary school children required special classes or resource programs for "behavioural" problems (CODE, 1978). Other children find themselves placed in special settings for "slow learners" and the "learning disabled". Many of these children would exhibit dysfunctional, impulsive characteristics.

Ontario statistics for 1978 (Statistics Canada, 1980) show that over 14 000 adolescents were adjudicated delinquent for violations of the criminal code. The vast majority of these were for theft, break and enter, possession of stolen goods, and mischief. During the 1970s in the United States delinquency increased by 250 per cent, with delinquents showing a recidivism rate of 85 per cent (Voorhees, 1981). According to the Canadian Senate report, Child at Risk (1980), such alarming increases in juvenile delinquency partially stem from children's not learning

how to cope with stress in the family and the community. Their reactions to stress are often inappropriate and may be characterized as frequently impulsive.

In the present study, the label of "high-risk" is used to characterize a population of adolescent students whose patterns of behaviour and school achievement place them in extreme jeopardy. These students may be on the verge of leaving or failing school without employable skills, and of engaging in delinquent or criminal activity if they have not already done so.

The Concept of Impulsivity

Impulsivity as a rigorously defined behavioural construct emerges from the work of Kagan, Moss and Siegel (1963) and Kagan (1966). The variable addresses the cognitive processes involved in problem solving in ambiguous situations. Operationally, the variable is often measured by the Matching Familiar Figures (MFF) test (Kagan et al., 1964) which observes the latency to first response and accuracy of choice in a non-verbal problem-solving task. In traditional studies of impulsivity those subjects who fall below the sample median for latency and above the sample median for errors (fast/inaccurate) are referred to as "impulsive". Subjects who fall in the opposing quadrant are referred to as "reflective" (slow/accurate). Given a random sample of young subjects, approximately one third will be clearly identified as impulsive using the MFF test (Block et al., 1974; Messer, 1976). Impulsivity as measured by the MFF test typically declines with age among the general population. In aggressive and delinquent populations, however, impulsivity does not decline to the extent normally expected (Messer, 1976; Salkind, n.d.).

In their discussion of the validity of the MFF test, Block et al. (1974) report a low and non-significant correlation between response latencies and accuracy of responding. Messer (1976) in his review of the literature on impulsivity reports a median correlation of $r = -.49$. These low correlations argue that accuracy, or lack of it, rather than speed of responding is the more central variable in the consideration of impulsivity.

A third and related variable is scanning and attending behaviour. In eye movement studies conducted during the administration of tasks such as those contained in the MFF test, impulsive adults and children make fewer eye fixations than the more accurate responders (Drake, 1970; Craighead, 1978). Impulsive search and scanning strategies are typically unsystematic, random, and global. Other attentional characteristics of the impusive child include those associated with hyperactivity, irrelevant talk and movement, lack of self-control, and off-task behaviour in general (Douglas, 1972; Campbell, 1973; Margolis et al., 1977; Kendall and Wilcox, 1979).

In a study of in-class behaviour associated with impulsivity among prison inmate students, Campbell and Davis (1981) report that impulsivity is manifested in behaviour characterized by dependence on social cues (field-dependence), low tolerance for ambiguity (conceptual level), and poor attention to relevant information in one's environment. Impulsivity emerged as a powerful construct for characterizing debilitating patterns of learning and as a guide for the selection of behaviour that would need to be changed to improve one's effectiveness as a student.

As used hereafter, impulsivity will refer to a cluster of associated behavioural traits which go beyond the narrow operational definition associated with the MFF test. The research literature, given impetus by the early work of Kagan, provides ample evidence for doing so.

A number of explanations have been offered for impulsive behaviour and the arguments vary in their focus and degree of reductionism. Ward and Yeudall (1980) report only soft neurological signs associated with impulsivity. EEG abnormalities appear frequently in prisoners convicted of violent acts; however, neurological dysfunction may be a concomitant rather than a cause of such highly impulsive behaviour. Voorhees (1981) in a study of neuro-psychological differences between delinquent and functional adolescents reported central nervous system abnormalities among the delinquent sample. These

abnormalities may be manifest in deficient motor, perceptual, and conceptual ability.

Less reductionistic explanations focus on deficits in the impulsive person's behaviour and learning, and resultant cognitive processes. A portion of this literature seeks explanation through a discussion of moral development and its effects on cognition (e.g., Kohlberg, 1969; Fodor, 1972; Jurkovic and Prentice, 1977; Hains and Miller, 1980). However, for purposes of the present study, explanations that focus on cognitive and behavioural dimensions of impulsivity are viewed as particularly relevant because they go beyond description and give rise to strategies for the modification of impulsivity.

Behaviourally-oriented approaches to impulsivity stress the lack of self-control and self-regulating behaviours (Mahoney and Thoresen, 1974; Ellis and Harper, 1975; Beck et al., 1979). These behaviours may not develop because of poor models in childhood (Child at Risk, 1980). Ainslie (1975) proposes that impulsiveness is the selection of immediate, but less desirable, rewards over delayed and more desirable rewards. In other words, impulsive persons lack the ability to delay gratification. Delayed gratification is one self-control mechanism adopted by reflective persons according to this view.

Other behavioural researchers extend their orientation to include inferences about cognitive processes. Feuerstein (1980) proposes a cognitive deficiency hypothesis in which impulsivity is the result of insufficient or inappropriate mediated learning experience. This deficit in one's early learning produces undeveloped exploratory skills reflected by difficulties in problem definition, in goal orientation, and in systematic exploration of relevant cues in the environment. Similarly, Kendall and Finch (1976, 1979) develop a response inhibitory control hypothesis. Impulsive children fail to inhibit immediately perceived ways of responding in the face of ambiguity or uncertainty because of a reluctance or inability to: 1) engage in search and scan activities, 2) generate response alternatives, and 3) delay action until consequences are evaluated.

This cognitive-behavioural perspective of impulsivity is further developed by Meichenbaum. Extending various verbal hypotheses (e.g., see references to Vygotsky, Luria, Reese, and Jensen in Meichenbaum, 1977), Meichenbaum (1975, 1977, 1979) and Meichenbaum and Goodman (1971) propose that impulsive ways of behaving stem from a child's failure to use private speech in self-regulation. In a three-stage process, voluntary behaviour eventually comes under the control of covert speech (verbal mediation) which provides self-regulation and monitoring. In the first stage, overt speech by others (e.g., parents or other adults) governs decisions and behaviour; in the second, a person's own overt speech assumes the role of self-regulation; and in the third, speech is internalized, becoming covert self-instruction. Jensen (in Meichenbaum, 1977) defines verbal mediation as "talking to one's self in relevant ways when confronted with something to be learned, a problem to be solved, or a concept to be attained. In adults the process generally becomes quite automatic and implicit... (p.29)"

Individuals who do not develop appropriate mediational skills will have difficulty in learning and problem-solving situations. These difficulties can present themselves in three ways (Meichenbaum and Goodman, 1971; Meichenbaum, 1977). A person 1) may not comprehend a problem sufficiently to recall relevant prior experience (mediators), 2) may have experience relevant to the problem but fail to recall it, or 3) may not be in the habit of relying on past experience to guide ongoing behaviour. Deficiencies in some or all of these mediational stages can result in impulsive types of behaviour. Imagine a child who failed to inhibit an act of vandalism. Using a mediational deficit theory, one may hypothesize that the child does not comprehend the nature of his or her act in the given situation; would comprehend the nature of the act if he or she had paused long enough to think (that is, compare the act to memory of similar acts); or does not use previous experience or knowledge in memory to generate alternative ways of behaving in the situation. Put simply, the child does not stop and think.

Modification of Impulsivity

In their own overview of the literature on impulsivity and its modification, Kendall and Finch (1979) and Messer (1976) conclude that impulsivity is modifiable to a degree and that the more powerful approaches are those that involve training for the purpose of improving attention strategies and self-verbalization. Other approaches, including imposed delay and manipulation of response contingencies, often fail to generalize beyond the treatment environment. Modelling can be a powerful strategy for young children when it is accompanied by contingency management.

Methods that attempt to enhance the attentional behaviour and verbal mediation strategies of the impulsive person may be described as "cognitive behaviour modification". Approaches under this umbrella term typically employ self-instruction training (Meichenbaum, 1975, 1977). Self-instruction training normally requires the child to verbalize overtly problem definition, alternative approaches to resolution, and attentional strategies. Self-instruction training forces the child to employ verbal mediation for which he or she has the capacity but perhaps not the motivation Camp (1977) and Camp et al. (1977) hypothesize that impulsive children rely on "association processing" of information and thereby fail to inhibit first available responses. Self-instruction training allows the child to supplant this dysfunctional approach with more cognitively-oriented processing. Language becomes a mediator for self-monitoring and regulation and, in so doing, performs a number of important functions: 1) attention is directed towards relevant events; 2) automatic responses to the environment are interrupted; 3) the opportunity arises to survey and select alternative courses of action; 4) appropriate rules and principles of of behaviour may be recalled and focused on the particular event providing a planned strategy for action (Meichenbaum, 1976).

The use of self-instruction training to modify impulsivity in young children has proven successful in a number of studies (e.g., Meichenbaum and Goodman, 1971; Kendall and Finch, 1976; Bender,

1976; Craighead et al., 1978). For example, in a study by Douglas et al. (1976), 18 hyperactive and impulsive children (mean age 7 years 9 months) were taught with modelling, self-verbalization, and self-reinforcement methods. After a three-month period of instruction and an additional three months of no instruction this group improved significantly compared to a matched control group. There have been few studies that demonstrate the approach with adolescents. One study by Snyder and White (1979) compared contingency awareness, cognitive self-instruction, and placebo treatments using a population of 15 behaviourally disturbed institutionalized adolescents (age range 14 to 17 years). The group had previously shown a resistance to change in an operant program. Subjects met with the investigator for six 45-minute sessions over a four-week period. Assessment immediately after treatment and over a six-week follow-up showed a significant reduction in impulsivity in the self-instruction group compared to the contingency awareness and placebo groups. Unlike the many impulsivity studies that rely exclusively on dependent measures from paper-and-pencil tests (e.g., the MFF test), the investigators employed observational reports of subjects' behaviour in their daily activities. The study did not examine the effectiveness of the program once the subjects were released from the institution.

* * * * * *

We have attempted thus far in the literature review to describe the nature and scope of the impulsivity construct and of approaches to the modification of impulsive behaviour. The following sections will focus specifically on the high-risk or delinquent adolescent and on the relevance of impulsivity as a powerful explanatory variable when considering this population.

The Link Between Impulsive Behaviour and Juvenile Delinquency

Impulsivity has been associated with a broad spectrum of socially maladaptive behaviours, most of which have been categorized as delinquent (Glueck and Glueck, 1950; Bratter, 1979; Leyton, 1979). Surveys have tended to support the notion that a common

characteristic of many delinquents is a lack of self-control, an apparent failure to self-regulate their behaviour, failure to delay gratification, and a tendency to behave impulsively (Hathaway and Monachesi, 1953; Ahlstram and Havinghurst, 1971). Clinical studies (McDavid and McCandless, 1962; McCord and McCord, 1964; Kvaraceus, 1966) also support the common assumption that the psychopath and delinquent are frequently characterized by deficiencies in self-control. Saunders et al. (1973) report that both professional and line staff commonly explain a wide range of delinquent behaviours in terms of an impulsive personality type.

The acceptance of the concept of impulsive behaviour as both characteristic and explanatory of delinquent behaviour is supported by some limited empirical evidence. Mangold (1966) has reported a difference in measures of impulsivity between a group of delinquent and non-delinquent subjects. The IES test, which is purported to measure the relative strengths of the impulse, ego, and superego, was administered to 30 incarcerated delinquent juveniles and a non-matched sample of 30 high school students who had never been arrested. Three of the four subtests of the IES (Arrow-Dot, Photo Analysis, and Picture Title) showed significant differences between the two groups on the impulse measure. This was supportive of the hypothesis that delinquents have higher impulse scores than non-delinquents.

Ostrov et al. (1972) attempted to describe an "impulsive index" which could be applied as a measure of juvenile delinquency. Impulsiveness was defined as the inability to delay gratification and the tendency not to weigh future consequences. These were measured by the reactivity to colour on the Rorschach and the discrepancy between performance and verbal IQ as measured on the Wechsler. A comparison of these measures and the self-reported impulsiveness and self-reported delinquency of 25 juvenile patients in a psychiatric institute confirmed two hypotheses. There was a significant negative correlation between the impulsivity index score and the perceived impulse control of delinquents, and a significant positive correlation

between the impulsivity index score and self-reported delinquency. In addition there was some evidence that delinquents from higher socio-economic levels may tend to be more impulsive than delinquents from lower socio-economic levels.

There is some evidence of a more sociological nature which emphasizes the role of impulse control in delinquent behaviour. Hogan and Mookherjee (1981) explored the association between self-reported delinquency and personal (internal) and social (external) control of behaviours. These two sources of control have been viewed as the "social glue" of a well-functioning society. In order to examine this rather basic notion, high school and college students were administered a battery of tests to assess personal and social control as well as self-reported delinquency. Of the personal control variables measured, self-esteem, anomie (relative lack of personal control), deviance proneness, and perceptions of being limited in the chances of legally achieving selected societal goals/roles were among those accounting for most of the variance in reported delinquency. This was seen as supporting the hypothesis that the greater the degree of personal control, the less likely a person will behave in a deviant manner.

Serok and Blum (1982) have recently examined delinquency from the point of view of rule-validating behaviour. They used a game-playing situation to simulate certain social interactions and the rule-violating behaviour occurring therein. Their interest was in the learning of social expectations and the product or performance of behaviours that are consistent with this learning. The study used a sample of 50 adjudicated juvenile delinquents and 50 non-delinquent youths. The findings revealed that delinquents violate game rules more often and react more aggressively to the game rule violations of others. This suggests an awareness of the game rules and norms of behaviour, but an inability to conform to expectations and control the impulse to violate those rules.

Some evidence from physiological and neuro-psychological studies suggest that delinquency and factors associated with

impulsivity, such as stimulus seeking, are related. Farley et al. (1979) were interested in a theoretical explanation of delinquency based on the exaggerated need for stimulation exhibited by some delinquents, attributed to a physiological arousal deficit. Previous research (Farley and Farley, 1972) had indicated that such delinquent behaviours as escape attempts, fighting, and disobedience were a significant function of arousal and the sensation-seeking motive. The prediction to be tested was that most delinquent behaviour would be found in persons characterized as low in physiological arousal and high in sensation seeking relative to those classified as high in physiological arousal and low arousal and low sensation seeking. A comparison of adult males hospitalized for drug addition revealed that those with good hospital discharges (non-delinquent) exhibited high arousal/low sensation seeking, while those with bad hospital discharges (delinquent) exhibited low arousal/high sensation seeking. This was seen as support for the contention that a physiological basis for distinguishing delinquents and non-delinquents may exist. Some Some limited evidence of pathological stimulus seeking in delinquents has also been reported by Shostok and McIntyre (1978). In their study, psychopathic delinquents classified according to Quay (1965) sought higher levels of sensory input as measured by augmented stimulation received during a kinesthetic aftereffect task.

In the previously cited study by Voorhees (1981), the subjects were 28 adjudicated juvenile delinquents and 13 adolescent high school students. Each was assessed on the Bender Gestalt motor visual test and the Luria Neuro-psychological Investigator (LNI). The LNI consists of a series of subtests which measure verbal, optic, motor, acoustic, kinesthetic, and monastic abilities. The results revealed that delinquents 1) displayed a general lower level of tolerance for the more difficult and ambiguous situations, 2) showed decreased eye-scanning abilities, 3) displayed difficulty in the immediate recall of dictated phrases, and 4) displayed significantly reduced recall ability when verbal or cognitive interference tasks were implemented.

These findings were discussed as support for previous findings (Reitan, Klove, and Heineman, 1973; Voorhees, 1981) of the impulsive, concrete, and distractive nature of delinquents who demonstrate impaired integrative and abstract cognitive abilities.

There have been some empirical findings that did not support the link between impulsive behaviours and juvenile delinquency. Studies by Saunders et al. (1973) and Glenwick and Croft (1975) compared impulsiveness between institutionalized delinquent populations and matched non-delinquent populations on a number of paper-and-pencil tests. They reported either no differences or more reflective delinquents. However, these studies are open to criticism because the delinquent samples were receiving socialization and other treatment programs during their incarceration. The latter authors suggest that their delinquent subjects may have been test-wise and have felt under pressure to do well.

One reason for contradictory research findings and an explanation of why the impulsive/reflective construct has received less than extensive attention in delinquency studies has been the tendency to assume that delinquency represents unitary personality traits or cognitive styles. On the contrary, evidence suggests that delinquent populations fall into distinct groups in terms of their social/cognitive development (Grocz et al., 1969; Miller, 1969). It would seem reasonable to argue that the impulsive style may exist in some, but not necessarily all, delinquents.

A recent study by McGurk et al. (1981) examined the personality types of young delinquents using a battery of tests. The subjects were 315 young men admitted to a detention centre for periods of three to six months. The tests administered were the Hostility and Direction of Hostility Questionnaire, the Psychological Screening Inventory, and the 16 Personality Factor Questionnaires-Form E. A discriminant functional analysis of raw scores identified four clusters of delinquent types. The second largest cluster (N = 107, 34 per cent of the sample) showed many impulsive characteristics: extra punitive hostility, social immaturity, happy-go-lucky, suspiciousness, expediency, group-dependence, social non-conformism, and extroversion.

Glaster (1975) notes that not all delinquents judge themselves to lack self-control or to have underdeveloped cognitive control. Cimler and Beach (1981) view some forms of delinquency as purposeful behaviour resulting from reflective and rational decision making. Yet, the evidence is convincing that the impulsivity construct is a powerful one for understanding many delinquents and their behavior.

Impulsivity and Problem-Solving

Little and Kendall (1979) have argued that rather than rely on the classification of delinquents on the basis of behavioural, pyschological, or psychiatric models, a more fruitful method might be categorization by problems in functioning that are common among a large number of delinquents. They have suggested as areas worthy of further consideration in delinquent behaviour: 1) problem solving or the abilities needed to solve interpersonal problems, 2) role taking as the cognitive capacity to take the perspectives of other people, and 3) self-control or the inhibition of impulses through language-based internal mechanisms.

The argument has been put forward in this paper and elsewhere (Messer, 1976; Ross and Fabiano, 1981) that impulsive behaviour may show its greatest impact with respect to inadequately developed problem-solving skills. The inability to take the time to analyse problems, to consider alternative solutions and reflect on the possible consequences of alternatives, may leave the impulsive individual no choice but to respond in a non-reflective, stereotyped, and inflexible way. When confronted with a problem, the goal may be to dispose of the problem immediately without self-regulating thought, rather than solve the problem.

There is some empirical support for the assumed link between impulsivity and problem solving. Emotionally disturbed adolescent boys, who were characterized as impulsive (Spivack and Levine, 1963), have been found to be deficient in three interpersonal problem-solving skills: means-end thinking, alternative thinking, and perspective taking. Impulsive,

institutionalized adolescent teenagers have been shown to be less capable of addressing themselves to the solution of hypothetical real-life problems, as well as being less capable of conceptualizing appropriate and effective means of solving such problems (Platt, Scura, and Hannon, 1973). Platt, Spivack, and Swift (1974) observed different patterns of responding to means-end problem solving for both psychiatric patients and controls. The controls were more likely to include an element of "thinking or introspection" on the part of the protagonist in stories before suggesting any other action on the part of the protagonist. In contrast, patients tended to give many more responses suggesting "the taking of immediate and concrete action".

Shure (1981) discusses research attempts to discover the earliest age at which problem-solving skills could be distinguished. Four-year-olds, who could generate alternative solutions to interpersonal peer and authority type problems, were likely to display relatively well-adjusted behaviours. On the other hand, poor problem solvers were likely to display characteristics of impulsivity or inhibition. Further study revealed that those youngsters who carried out impulsive acts, such as hitting other children or grabbing toys, were deficient in consequential thinking skills relative to their well-adjusted peers, but could think of more potential consequences to such acts than could the socially inhibited peers. This suggests that the impulsive act may be emotional reaction to frustration or may simply reflect the inability or unwillingness to think of something else to do. Mitchell and Ault (1979) attempted to assess the relationship between performance on the MFF test and hypothesis generating and testing, on one hand, and evaluation of the quality of one's own solutions, on the other. They administered the MFF test and a pattern-matching task to 95 children. These tasks provided measures of the type and quality of information a subject chooses to gather (hypothesis testing) and the quality of each solution offered (evaluation). On the basis of their results they concluded that the MFF test appears

to be related to measures of evaluation but not to measures of hypothetical testing in problem solving.

A similar result is discussed by Heckel et al. (1981) who compared the MFF test scores and self-rated success of 60 male and female undergraduate problem solvers. There was a significant difference in the impulsivity scores of self-rated high-success and low-success problem solvers. This was discussed in terms of a learned response to problem solving on the part of impulsive subjects. They hypothesized that those who have experienced low success in problem solving may adopt an impulsive response pattern in order to get rid of the unpleasant task. The authors suggested training in problem solving using immediate performance feedback and use of modelling to improve the problem-solving performance of impulsive persons.

Problem-solving performance may not simply be related to the quantity of information available in memory. Cegalis and Ursino (1979) showed that implusive subjects (as classified by the MFF test) were able to retain significantly more stimulus items in memory than reflective subjects when there was low stimulus complexity and ambiguity, and limited response alternatives. Gow and Ward (1982), in a study of impulsive responses to the Porteus Maze test, isolated responses that not only showed a hasty and slap-dash approach to the task but were also the result of a failure to plan ahead and adequately consider the problem.

Delinquent Problem-Solving

There is extensive evidence to support the contention that one of the differences that distinguishes some forms of delinquent behaviour from the behaviour of non-delinquents (and even other delinquents) is the ability to solve problems. This does not mean the ability to solve impersonal intellectual tasks such as anagram puzzles or arithmetic tasks, but rather refers to interpersonal problem solving or effective coping in social situations (Little and Kendal, 1979).

A series of studies has used the Means-End Problem Solving (MEPS) techniques to assess adolescent and delinquent real-life

problem-solving skills. The MEPS presents a story in which a need arises for the protagonist and is later satisfied. Subjects are required to provide a middle for each story. Platt, Spivack, and Swift (1974) determined that adolescents who may be assumed to be making a satisfactory adaptation to their environment are ones who 1) have more readily available optional behaviours that can be called upon when faced with a problem, 2) are more capable of thinking in terms of effective step-by-step methods of reaching specified goals in interpersonal situations, and 3) are able to see a situation from the perspectives of other individuals. A complete list (Spivack, Platt, and Shure, 1976) of the skills that have been found relevant for successful interpersonal problem-solving or coping in social situations includes:

- sensitivity to interpersonal problems
- tendency to link cause and effect spontaneously (causal thinking)
- readiness to view possible consequences of actions (consequential thinking)
- ability to conceptualize step-by-step the means for reaching specific goals (means-end thinking)
- ability to view situations from the perspective of other individuals involved (perspective taking)

These abilities have been shown to be independent of IQ, education, and mental health (Platt, Spivak, and Swift, 1974).

In contrast, emotional problem-solving -- that is, the ability to cope with one's own negative emotional states or emotional problems -- would seem to entail different thinking processes for adolescents. Siegal, Platt, and Peizer (1976) report that normal control subjects as compared to adolescent psychiatric patients demonstrate superior social problem-solving, but not emotional problem-solving, after the effects of IQ are partialed out. This suggests that emotional problem-solving may require a greater ability to engage in abstract thinking than problem solving in the social sphere. Solutions to social problems may be provided by cultures as part of the socialization process, whereas

solutions to emotional problems require the abstraction of elements from one's own subjective experience and the formation of highly subjective solutions. On this basis, the more intelligent person may be better able to engage in emotional thinking than the less intelligent person.

Higgins and Thies (1981) have recently used MEPS techniques to assess specifically the social effectiveness and problem-solving thinking of young adult first-time reformatory inmates. The hypothesis to be tested was that inmates identified as "misfits" and "disciplinary problems" would have limited success in addressing and providing solutions to hypothetical real-life problems. The Disciplinary group was identified on the basis of frequent Disciplinary Court appearences, while the Misfit group was identified by officers, counsellors, and inmates as individuals unable to function well in any context. For purposes of comparison, a Success group was identified as those inmates making the most satisfactory adjustment to the institution. Performance on a hierarchy of successful problem-solving skills was found with the Success group to be significantly better than the Disciplinary group, and the Disciplinary group significantly better than the Misfit group. The results were offered as support for the hypothesis that effective problem-solving thinking may be related to social adjustment.

Little and Kendall (1979) report a study by Freedman which compared the approaches used by delinquent and non-delinquent groups to a set of typical interpersonal problem situations faced by high school male students. The results indicated significantly poorer performance by the delinquent group in terms of the provision of effective solutions to the problem situations.

In later work, Freedman, Rosenthal, et al. (1978) developed an Adolescent Problem Inventory (API) designed to identify the strengths and weaknesses in the personal and interpersonal skills repertoires of adolescent boys. The API consists of 44 problem situations and can be used to identify and differentiate between the performance skills of delinquent and non-delinquent boys. It is

administered as a behavioural role-playing test. A preliminary validation of the API revealed significantly poorer problem-solving performance for delinquents than for two control groups (good citizens and leaders). A second validation study compared API responses of institutionalized delinquent boys, who had frequent behavioural problems within the institution, with institutionalized delinquent boys with few acting-out problems. The high-disruptive subjects scored significantly lower than the low-disruptive subjects and scored significantly worse in an item by by item comparison.

A third validation study attempted to assess whether the delinquents' poorer API performance was actually due to skills deficits or was simply an artifact of the task format. Alterations in format from open-ended, free-response to multiple choice format improved the performance of delinquent and non-delinquent alike, although delinquents still peformed significantly poorer than non-delinquents with the multiple choice format. This result suggests a delinquent deficiency in recognizing competent responses.

The authors concluded from their studies that the API is a valid measure of social competence in adolescent boys and suggested that a wide and varied array of skills deficits can be related to delinquency. They argued that it should not be expected that a single deficit or pattern of such deficits is likely to explain delinquency. The probability that an individual will be classified as a delinquent would seem to increase as a a function of such conditions as 1) the extent to which the individual lacks the requisite skills to deal effectively with the everyday problem situations confronting him, 2) the frequency with which he encounters such problem situations, and 3) the 3) the degree to which his incompetent solutions to such problems take the form of illegal behaviour.

Treatment Approaches for Impulsivity with High-Risk Populations

In support of the link that would seem to exist between those delinquents who might be classified as impulsive and those delinquents who are deficient in problem solving are a number of

treatment programs which have been able to show improvements in both impulsive behaviours and problem-solving skills.

Cognitive behaviour modification (CBM) techniques have been successfully applied in three reported studies. Ross and Fabiano (1981) report that Snyder and White found a decrease in the impulsive behaviour of institutionalized adolescents as well as an increase in their school attendance. Williams and Akamatsu (1978) also found improved scores on tests of impulsivity with male and female residents of a medium-security facility for juveniles using CBM techniques. A study by Bowman (1979) combined the problem-solving behaviour modification techniques of D'Zurillia and Goldfried (in Bowman, 1979) with relaxation training and verbal self-instructions. Bowman reports that impulsive delinquents taught to relax, reflect, and delay responding to emotionally provoking situations showed fewer charges for disruptive behaviour and rule breaking in the institution than did a control group.

Interpersonal skills training or social skills training has also been applied to delinquent groups with some indications of reductions in impulsive behaviour. Bornstein, Winegardner, et al. (1979) trained male prison inmates of Montana State Prison in effective interpersonal tasks such as initiating and terminating conversations, dealing with heterosexual rejection, and being more assertive. Experimental subjects obtained superior scores to control subjects on the Impulsivity score of the Personality Research Form (Jackson, 1967). Spence and Spence (1980) conducted social skills training with adolescent male offenders aged 10 to 16 years. The specific training methods included instructions, discussion, modelling, role play and practice, videotaped feedback, social reinforcement, and homework tasks. The training was targeted at both basic skills such as eye contact and postures and more complex skills such as dealing with teasing, bullying, or accepting criticism. Results indicated that such training could shift the locus of control of young male offenders towards the belief that one's behaviour and consequences are controlled by oneself rather than external

factors. Shure (1981) reports on the results of training in interpersonal cognitive problem-solving with children designed to enforce the ability to think through and solve real-life interpersonal problems. Impulsive children, so trained, become less impatient and demanding and less likely to explode into emotional outbursts when faced with frustration.

None of the above studies has examined the impact that these programs might have had on the recidivism of young offenders. The following studies, however, have demonstrated some long-term rehabilitative benefits of training in problem-solving and interpersonal skills.

One of the most comprehensive programs in the interpersonal cognitive problem-solving approach has been developed by Platt, Spivack, and Swift (1974). It stems from the successful work of Sarason and Ganzer (1973) who had concluded that the critical variable in the successful treatment of delinquent subjects may have been the teaching of problem-solving skills. The program also incorporates aspects of Meichenbaum and Cameron's (1973) technique of self-instruction training as well as a modification of the Matching Familiar Figures test. Platt, Perry, and Metzyer (1980) have used training in interpersonal cognitive problem-solving with adult male offenders with a history of heroin dependency. A trained group improved in a number of areas including general adjustment, self-evaluation, and belief in their personal control at drug use, relative to untrained controls. A two-year follow-up indicated significantly lower recommitment rates for for the trained versus untrained groups.

The study by Sarason and Ganzer (1973) examined modelling and group discussion as a means of communicating information relevant to the social, vocational, and educational adjustment of institutionalized male juvenile delinquents. The modelling, role-playing, and structured discussions prompted more positive attitudes, behaviour change, and less recidivism among treatment participants as compared to a control condition.

Little and Kendall (1979) report a study by Scopetta who used a combination of problem-solving skits, role playing of problem

situations, and group discussion. Delinquents who participated in the program showed a significant reduction in anti-social behaviour compared to a delinquent group involved only in problem-solving discussions.

Bennett and Chatman (1979) have trained adult offenders in problem definition, fact-finding approaches, data-gathering techniques, synthesis, and other reasoning procedures. They report that the program had a positive and significant effect on parole outcome up to two years after release. In addition, an extended follow-up indicated that program participants spent an average of 50 per cent less time incarcerated than a non-trained comparison group.

Behavioural training methods such as mock training and role playing of job interview skills have been used with probationers to improve their self-rating and objective rating of job-interview performance as well as their actual ability to obtain employment (Twentyman et al., 1978). Golden, Twentyman, et al. (1980) used similar strategies to enforce the social interaction skills of probationers in their dealing with authority figures. In this case, treatment included instruction, response demonstration using audiotaped models, practice both with and without written cues, coaching, proctor feedback, and audio feedback. The results suggested that specific social skills can be used to train offenders effectively, although there was little evidence that such training would generalize to untrained situations.

Albert Ellis's rational emotive therapy has been used to teach alcoholic recidivistic offenders to increase their skills in reasoning (Goodman and Maultsby, 1974). The training led to a steady decline in the number of discipline reports, and during a six-month follow-up only 13.3 per cent of the offenders had problems severe enough to have their parole revoked. The CREST program (Lee and Haynes, 1980) also used rational emotive therapy in a primarily one-on-one counselling situation (although role playing and the positive reinforcement aspects of behaviour modification were also used) to focus on the thought processes

and perceptions of male and female probationers. The purpose was to modify subjects' thinking errors and irrational associations. Ross and Fabiano (1981) report follow-up evaluations of this program which show that CREST trainees have committed 50 per cent to 82 per cent fewer criminal acts than a variety of matched comparison groups and randomly assigned non-trained controls.

Two studies have been reported which show both a reduction in recidivism and a reduction in impulsive behaviour for juveniles who have been trained in interpersonal problem-solving skills.

Spence and Marzillier (1981) used social skills training, which consisted of modelling, role playing, feedback, social reinforcement, and task assignments, to train young male offenders. A number of change variables were examined, including: 1) such specific behaviours as eye contact, fiddling, head movements, and attention feedback during listening, 2) basic social skills such as friendliness, social skills performance, social anxiety, and employability, and 3) offences committed after training. The majority of subjects who were trained showed positive changes in the targeted behaviours of eye contact, fiddling, and head movements. There was a failure to train attention feedback, suggesting that this may be an advanced listening skill which is difficult to train. Basic social skills were measured by independent raters viewing videotapes of subjects. However, there were no observed differences between the trained group, an attention control group, and a control group. Offences were assessed on the basis of self-reports and official police convictions. Interestingly, during a six-month follow-up the trained group reported more offences, while official convictions were fewer. None of these groups were, however, significantly different on either self-reported offences or official police convictions.

Sarason and Sarason (1981) conducted a study of modelling and role playing to enhance the cognitive and social skills of students who could be described as drop-out and delinquency prone. Many of these students recognized impulsive behaviour -- that is, not thinking about the results of an action before

acting -- as a source of many of their personal difficulties. An emphasis in training was therefore placed on 1) the consequences of action, 2) the alternatives available in a situation, 3) the effect of the individual's behaviour on others and an increased understanding of others' points of view, and 4) communication skills, particularly with non-peers. A comparison of two experimental and two control groups revealed that trained subjects showed improved ability to adopt a problem-solving attitude and to be introspective. A one-year follow-up indicated that trained students showed improved measures of absences, tardiness and behaviour referrals.

Ross and Fabiano (1981) interject a note of caution about the importance of cognitive training. They suggest that no effective programs have been found that did not employ a multi-faceted approach. They suggest that studies that provided only cognitive skills training have yielded improvements in cognitive functioning, but not in such broad measures as social adjustment, institutional adjustment, or recidivism. They argue that cognitive training is essential but not in itself sufficient to change maladaptive behaviour.

The Present Study

The purpose of the preceding literature review has been to show the strong evidence for a link between cognitive impulsivity and behaviour that is dysfunctional and perhaps delinquent or criminal. Given the contributing factors of impulsivity and other deficits or stresses in a student's life, it may readily be inferred that such students are indeed at risk and in jeopardy of failing to achieve many expectations of our society in areas of education, social relationships, emotional adjustment, and employment.

Impulsivity has been examined as a mental construct which is associated with a person's ability to think and to solve problems and make decisions effectively. Emphasis has been placed on aspects of cognitive processes which render the impulsive person either unable or not willing to perform certain elaborations in

his or her thinking activity. These processes include scanning and screening the environment for relevant information, generating alternative solutions or outcomes to ambiguous problems, and weighing consequences or judging the correctness of responses.

Evidence was reviewed which suggests that such faulty cognition is modifiable. That is to say, more reflective ways of thinking can be learned. A number of promising treatment approaches were reviewed, each having in common the view that practice in problem-solving, attention control, opportunity for verbal elaboration, and feedback are essential components.

The present study sought to put in operation each of these variables in a high school classroom setting. It was predicted that the enhancement of verbal mediation and attentional behaviours through self-instruction training will reduce the incidence of behaviours associated with cognitive impulsivity among high-risk adolescent male students.

In the present study, the following considerations were given to the four variables mentioned above:

Opportunities for problem-solving activities and making mediational activity overt through discussion must be intensive and extensive. Brief exposure to educational treatment programs is not sufficient for either lasting or transferring effects to take place (Coates and Thoresen, 1979). Therefore, problem-solving sessions were planned frequently for students over a period of months. Opportunity for practice in mediational activity would come about through the in-class problem-solving sessions and through individual self-instruction training and discussion of each session following class. Attention control and feedback would be achieved through the use of small-group problem-solving sessions in the classroom, individual post-session discussions, and viewing videotapes of the sessions during these discussions. The use of videotape for aiding in recall, for cueing subjects to particular details of their behaviour, and for controlling attention has been used in previous modification studies of impulsivity (Spence and Spence,

1980) and of other dysfunctional behaviours (Hung and Rosenthal, 1978).

Method

Subjects

A pool of high-risk students at Loyalist Collegiate and Vocational Institute (Kingston) was identified through consultation with the vice-principal, counselling staff, and teachers who work on a day-to-day basis with the students. The students selected for the study were all members of the Working and Learning program. This co-operative education program was designed for male and female students who may have left school early but were unable to find or hold jobs and therefore returned to school, or who had a history of poor school achievement and were inclined to leave. The Working and Learning program invited such students to attend special classes in the morning followed by job placements in the afternoon.

The MFF test (adult/adolescent) was individually administered to the 24 male students in the program. This non-verbal, perceptual test involves the simultaneous presentation of a stimulus figure and eight facsimiles which differ on one or more details. The subject is asked to pick the one facsimile that is identical to the stimulus figure, responding as many times as required to get the correct choice. Two practice and 12 different test figures are presented with measures recorded of latency to first response and errors for each set of figures (see Appendix A for MFF test sample). Messer (1976) reports one- to eight-week test-retest reliability estimates ranging from $r = .39$ to $r = .80$ for errors.

The median-split procedure was used to rank order the students from high to low impulsive. Of those identified as being the high end, 16 agreed to participate. They were randomly assigned to an Experimental group, an Attention Control group and a Control group, containing six, six, and four students respectively. The classroom teachers were not made aware of the group assignments. The consent of students and, in the case of

minors, of their parents, was obtained before proceeding (see Appendix B).

Table 1 provides relevant information on which to judge the similarity of the three groups. The groups were judged comparable on the basis of performance on the MFF test (errors) and age. Previous school achievement, as measured by credits, was found to be low in the Experimental group.

It should be noted that during the course of the four-month study there was considerable attrition of subjects due to expulsions from school and chronic absenteeism. At the completion of the study there were two subjects in the Experimental group, four in the Attention Control group, and three in the Control group for a total of nine subjects. Those who completed the study are identified in Table 1 by an asterisk.

Table 1

MFF Test Scores, Age and Number of Credits for Subjects by Group

Experimental Group				Attention Control Group				Control Group			
MFF test		Age	Credits	MFF test		Age	Credits	MFF test		Age	Credits
Lat.	Err.			Lat.	Err.			Lat.	Err.		
14.3	12.0	17.0	15.0	25.2	10.0	17.0	18.0*	16.2	10.0	18.0	18.0*
15.5	14.0	17.0	9.5*	13.8	15.0	16.0	10.0*	35.2	11.0	18.0	12.0*
12.6	19.0	17.0	9.5*	19.9	13.0	17.0	13.0*	13.7	14.0	18.0	12.0*
27.2	10.0	15.0	9.0	48.1	7.0	17.0	21.5*	15.6	14.0	17.0	14.0
48.5	8.0	17.0	18.0*	10.0	24.0	18.0	10.0				
25.9	17.0	18.0	4.5	25.7	13.0	18.0	18.0*				
$\bar{X}$ =24.0	13.3	16.8	10.9	23.8	13.7	17.2	15.1	20.2	12.5	17.8	14.0
SD=12.3	3.8	1.0	4.8	12.3	5.3	0.8	4.8	8.7	1.8	0.5	2.8

* Subjects who remained at conclusion of study.

Setting

The Working and Learning program consisted of morning instruction in a single classroom and afternoon placements at job stations. The class was conducted by two teachers, one of whom was responsible for life-skills training and mathematics, the other for English.

The researchers were provided with a small room next door to the classroom for the purposes of reviewing videotapes of classroom exercises, self-instruction training of students, and storing the videotape recording equipment.

Procedure

Twenty-six group problem-solving sessions were conducted during the first 20 to 30 minutes of morning classes over the period March 1 to June 25, 1982. Each session was videotaped. For reasons of continuity and control, the research associate took the major responsibility for presentation of these sessions. The content of the sessions ranged from non-verbal, value-free exercises to discussion of ethical issues and practical personal problems (see Appendix C for examples).

Prior to each presentation, four to six of the students representing the Experimental, Attention Control, and Control groups were chosen to participate. The students were requested to sit in a specific location to facilitate videotaping. Upon completion of the session the students who were in the Experimental or Attention Control groups were asked to accompany the researcher at different times for the purpose of viewing the videotape playback. This viewing normally took place within 24 hours of the session. The members of the Control group were not required to participate any further than being videotaped during a session.

The members of the Experimental group were individually interviewed and given self-instruction training while viewing the videotape of the problem-solving session in which they had been involved. The students were asked to comment on their actions, both verbal and non-verbal, as they listened to and viewed the

videotape. The researcher directed the subject to analyse the thinking behind his decisions and actions in an attempt to persuade the subject to verbalize overtly the mediating activities which otherwise would remain covert. The questions that were posed to the subject fell into one of three categories related to mediation in the cognitive processing of information. These categories are input, elaboration, and output. Table 2 provides examples of the type of questions asked in each of the three categories.

Table 2

Typical Probe Questions in Three Categories of Cognitive Information Processing

Input:	Did you understand the question posed by the teacher at that time? Do you understand it now? Did you have time to gather all of the information necessary for a correct response? Would you now wait for more information before responding? Did you want to ask the teacher for clarification of the question or issues involved?
Elaboration:	What kinds of information did you think about before answering the question? What additional information would you now use? Did you rehearse your answer internally before replying? When you formulated your answer, did you consider the most obvious answers, or did you elaborate and think about a lot of different things?
Output:	Repeat to me your answer to the teacher? At that time, were you satisfied with the validity of your answer? Did you feel it required more elaboration on your part? Did you hastily answer the question or did you pause for a moment first to collect your thoughts? How would you answer the question now -- would you change your original answer in any way?

As each category was explored and questions posed to the subject, the videotape playback was paused in order to "freeze" the situation and to provide the researcher and subject with time

to discuss and elaborate upon the subject's replies. The emphasis in this procedure was to give the subject practice in "stop and think" behaviour while controlling attention. In order to assist and train the Experimental students in self-oberservation, in the analysis of maladaptive behaviour, and in the alteration of that behaviour, a series of self-instructional strategies were presented. The complete list of self-instructional strategies is presented in Table 3. Students were requested to read aloud those strategies that could be employed to assist in the individual's processing of relevant information.

At the beginning of each of the interview sessions the students were requested to recall the self-instructional strategies previously discussed. New strategies were not emphasized until the the student could recall the previous strategies. Upon completion of the total number of self-instructional training session each subject in the Experimental group had covered all of the self-instructional strategies outlined in Table 3.

Each of the interview sessions was audio-recorded and a record kept of the progress made by each subject. In this way each interview was tied into those preceding it, and the researcher was able to document progress through the three categories of cognitive information processing.

Attention Control group subjects were also requested to review the videotapes of the sessions in which they participated. It was not deemed necessary that this be done on an individual basis. Consequently, three to four Attention Control subjects might be allowed to view a session at the same time. As a rationale for viewing the videotape feedback, the Attention Control subjects were asked to complete a rating form that would describe their feelings about the videotape session. The rating

Table 3

Stop and Think

Self-Instructional Strategies

Am I prepared to think about this problem?
If not, I can prepare myself by relaxing, taking a few breaths, and taking my time.
If I am prepared, I should read or listen to all the information.
I should know the setting of the problem or issue, what is being asked of me and what the key words are.
I should put the problem or issue in my own words.
I must ask myself if I understand the problem or issue.
If I don't understand the problem, I should review the information.
If I still don't understand, I can talk it over with someone.
When I'm sure I understand the problem, I can begin to explore answers.
I will not settle for the first idea that comes to my mind, but I will explore alternative answers or ideas.
I can develop alternatives by looking at the problem from a different point of view. I can use my personal experience; I can try to visualize the problem - see it happening; I can put myself in the situation. I can draw a diagram; I can look for patterns.
I should select one of the alternatives and talk myself through it.
I must ask myself if my answer is correct.
If I don't think it is correct, I should explore the other alternatives. I should listen to others and ask questions.
I should explore all alternatives or talk them over with someone and select the best of all alternatives if I can't find the correct answer.

---

form used a semantic differential technique whereby the subjects had to choose a point on a continuum between two opposing word meanings. The subjects completed this rating as they watched the videotape playback.

All subjects were scheduled to participate in approximately 12 videotaped, problem-solving activities in the classroom. Experimental subjects would also receive 12 training sessions. Attention Control subjects would receive 10 playback sessions.

Upon completion of the study, the two subjects remaining in the Experimental group had both been videotaped and interviewed 12 times. The subjects in the Attention Control group had been videotaped between 10 and 12 times, with two of them completing 12 playback sessions, one 11, and the fourth 10. Of the subjects remaining in the Control group, one completed all 12 videotapings, while another completed 11 and the third completed 8.

The Dependent Variables

A modified version of the Self-Control Rating Scale (Kendall and Wilcox, 1979) was used as one measure of program effectiveness. Each of the subjects in the study was rated by the two Working and Learning program teachers. One rating was completed prior to the commencement of the study and the second rating was completed at the conclusion of the study (see Appendix D).

Each item of the Self-Control Rating Scale (SCRS) is accompanied by a 7-point scale. A score of 1 indicates a maximum of self-control. A score of 7 indicates maximum impulsivity. Scores were summed across items for each teacher and a mean obtained from the combined scores of the two teachers. Agreement between the two teachers on the SCRC at pre- and post-periods was acceptable, with rho coefficients at $r = .60$ and $r = .80$ respectively.

The Self-Control Rating Scale was developed to assess the generalized effects of self-instruction training in a classroom setting. In the original version teachers rated students on a 33 item scale related to both cognitive and behavioural self-control Items were developed and selected as the result of a factor analysis of a pool of items. Reliability of the SCRS is high, with internal consistency at .98 and test reliability at .84 (Kendall and Wilcox, 1979). Construct validity with the MFF test errors has been reported at $r = .25$ (Kendall and Wilcox, 1979) and $r = .50$ (Campbell and Davis, 1981). In the later study, the SCRS showed good convergent validity with independent judges' ratings of student problem-solving behaviour ($r = .82$).

Given the high internal reliability, it was possible to

shorten the scale to 15 items without significant loss of utility. The primary purpose for reducing the number of items was to lower the potential fatigue (a source of unreliability) teachers may have felt completing the original version for 16 students.

A second dependent variable consisted of independent ratings by three trained judges of the videotaped classroom situations. Four 15-minute videotapes were selected for each student. The selection of videotapes to be viewed followed a random stratified sampling procedure. The total number of videotape sessions for each subject was subdivided into four groups representing early, early-middle, late-middle, and late sessions in the study. One of the videotapes within each of the four groups was randomly chosen to represent that group.

The judges were Masters of Education students from the Faculty of Education, Queen's University. Each judge had a number of years teaching experience and was assumed to possess some general knowledge of the concept of impulsive/reflective cognitive style as applied to classroom learning situations. The judges were trained on sample videotapes prior to the scoring of actual subjects.

All four videotapes of an individual subject were presented contiguously, although the temporal order had been rearranged by random assignment of the four videotapes. The judges were informed that the order of the videotapes had been randomly assigned and that they were simply requested to rate each tape as an individual session.

The judges viewed each tape for 15 minutes. At the end of each minute a tape recorded prompt required the judges to count the number of impulsive-type behaviours that had occurred in that minute (see Appendix E). The five specific behaviours addressed were: response latency, distractibility, attending behaviour, awareness of task, and disruptions.

Subsequent analysis of agreement among the three judges resulted in elimination of one set of scores. Agreement among the remaining two was high, with a mean rank order correlation of

r = .82. A score for each subject was derived by summing the number of impulsive incidents observed by the two judges in each videotaped session.

Results

Results will be reported using descriptive statistics. The small number of subjects in the study precludes generalization to a larger population.

MFF Test as a Measure of Impulsivity

Results on the MFF test, which was administered to all subjects at the commencement of the study, indicate that the sample chosen met the criterion of impulsivity. Mean errors on the test for the initial sample of 16 was 13.2 (SD = 4.3). The mean for the nine subjects who completed the study was 12 (2.3). Salkind (n.d.) reports a mean error rate of 8 for a sample of 226 children 12 years of age and notes that the number of errors stabilizes after age 9.

Further evidence of impulsivity among the sample is indicated by the number of students who dropped out of the study for what can be regarded as impulsive behaviour -- for example, poor attendance, and other actions leading to expulsion from school. The MFF test error rates were on the average higher for those who dropped out than for those who completed the study. The means were 14.7 and 12 respectively.

Teachers' Rating of Change in Impulsivity

The MFF test correlated r = .52 with initial scores on the Self-Control Rating Scale (SCRS). The SCRS can therefore be regarded as a moderately valid measure of those behaviours assessed by the MFF test.

Table 4

Pre- and Post-Program Mean Self-Control Rating Scale Scores

	$\bar{X}$ (SD) SCRS scores		
Group	Pre	Post	Difference
Exp.	45.5 (15.6)	29.8 (6.0)	-15.7
Atten. Cont.	55.0 (20.8)	55.3 (18.5)	*
Cont.	55.3 (4.0)	55.8 (9.1)	*

* negligible

As shown in Table 4, teachers observed a substantial decline in the day-to-day impulsive behaviour of the two students who received the self-instruction training. Over the four months, such behaviours were observed to have decreased by about one third. No such change was observed among students in the Attention Control or Control groups. A look at individual scores reveals that whereas substantial improvement was observed for the two Experimental subjects, five of the remaining seven showed no improvement or a decline and two showed only moderate improvement relative to those in the Experimental group. These differences are perhaps all the more noteworthy because the Experimental group was judged lower in impulsive behaviour at the beginning of the study than the other two groups. Assuming improvement becomes more difficult the lower one is on the scale, the Experimental group difference may be viewed as all the more substantial a gain.

Judges' Rating of Change in Impulsivity

The first set of judges' ratings correlated r = .05 with the MFF test (errors) and r = .56 with the SCRS. The second set of judges' ratings and SCRS ratings correlated r = .64. The negligible correlation with the MFF test suggests the absence of convergent validity. However, the moderate correlations with the SCRS indicate sufficient validity to apply the judges' ratings. The judges were perhaps observing a cluster of behaviours, also observed by teachers on the SCRS, which are related to a broad spectrum of impulsive and self-control behaviour, but which may not be related to the narrow range of behaviours captured by the MFF test.

The judges' ratings also indicate an improvement in performance among the two students in the Experimental group relative to those in the control groups. Figure 1 compares means of judges' scores at monthly intervals. Judges rated all subjects to be low in impulsive behaviours at the beginning. Perhaps students were somewhat inhibited at this early point given the presence of a TV camera and new "teacher" (research associate) in the room. Over the months, however, judges observed increases in impulsive behaviour among all subjects, but most dramatically among those in the control groups. Students in the Experimental group remained relatively stable over the four sessions. This stability is particularly noteworthy at the time of the third session which provoked substantial numbers of impulsive behaviours among control students. The Experimental students were not nearly so provoked, and remained relatively more reflective.

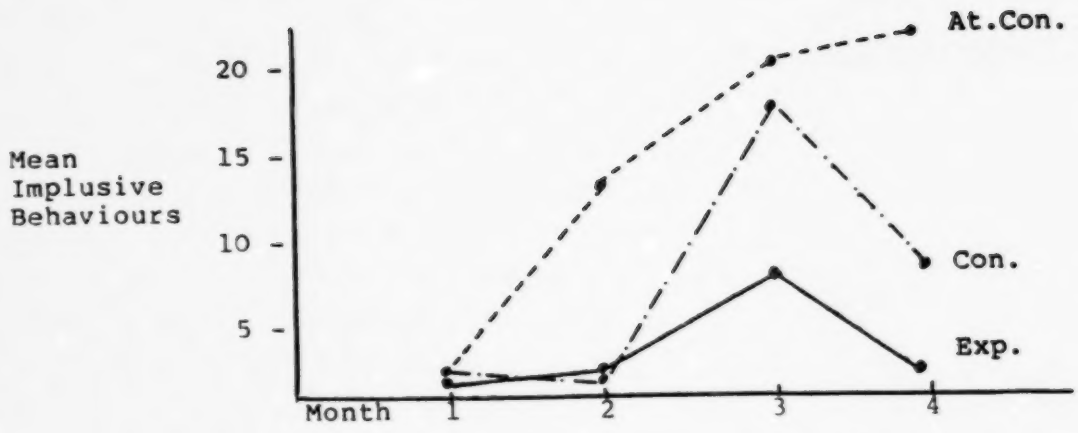


Figure 1. Means of judges' ratings of impulsive problem-solving behaviour at intervals of one month

The same data are provided in Figure 2 in the form of Z scores. These standard scores eliminate session-to-session differences resulting from such sources as the session content, interest taken in individual sessions, and changes in all students' behaviour over the four months -- for example, change due to the arrival of Spring, end of term, etc. Experimental students are shown to be consistently below the mean on impulsive behaviours for all students, whereas, with one exception, control students are consistently at or above the mean.

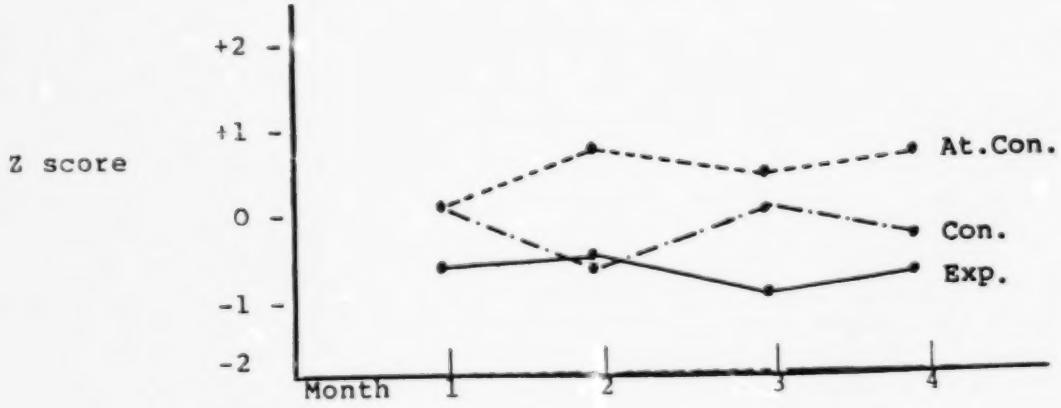


Figure 2. Judges' ratings as Z scores of impulsive problem-solving behaviour at intervals of one month

Individual Experimental Group Students

Group statistics can have the effect of masking the way in which individual subjects interact with programs. Given the few students who completed the experimental aspects of the program, it would seem desirable to discuss each of them briefly.

The first student, who will be called Alan (subject E2), was 18 years old and had completed 9.5 high school credits by the end of the year. Alan was living at home and had a part-time paying job. He had had a number of encounters with the law and had been convicted on at least one charge. Alan scored 14 on the MFF test (errors), which was slightly above the mean. At the outset of the study, his teachers rated him at 56.5 on the SCRS, which would also place him slightly above the mean for the total student sample. At the conclusion of the study he was given a rating of 34, fully one standard deviation below the total group mean. This pattern was not so evident to the judges who viewed Alan on videotape. They observed little evidence of impulsive behaviour except during the third session in which he was seen as unattentive, distractible, and unaware of the requirements of the problem.

Alan had 12 self-instruction training sessions. After the fifth session he was able to recall an average of 6 of the 15 self-instruction strategies (see Table 3) presented to him.

At a debriefing session at the conclusion of the study, Alan was asked some general questions about his experiences. He stated that he found some, but certainly not all, of the in-class problems interesting. The most interesting were those he already knew something about. Of the self-instruction training, Alan remarked that he found much of it "stupid" but he had learned "not to speak out a lot" in class, whereas he "used to do that a lot". He also remarked that he was better able "to solve problems" in class but did not see how it would help him outside of school.

Seeing himself on videotape helped him to "see where [I] make mistakes... which helps".

The second Experimental group student (subject E5) will be called Bob. He was 17 years old, had completed 18 credits, was living at home, and had a non-paying job placement at a local bookstore. He had been charged with a number of offences which he described as "not serious" but "stupid". Bob's score on the MFF test (errors) was 8, which places him well below the mean of the total sample but above the extrapolated mean of a random sample of 17-year-olds. On the SCRS, his teachers rated him well below the mean impulsivity of the total sample of students (34.5). At the conclusion of the study, his teachers rated him the least impulsive and having the most self-control (25.5) of all the subjects. Bob also had 12 self-instruction training sessions. His ability to recall the strategies increased steadily after the fifth session. His average recall was 11 out of the 15 and his use of these strategies was most evident in the final three sessions. During one of his sessions, Bob described in detail how he had used the strategies to solve a personal problem at home. It was necessary for him to complete three tasks, each varying in time required and interest. He described how he judged the consequences of performing or not performing each and how he determined the order in which they should be done. He was able to select an option that had not been obvious to him but was later seen as the best option.

At the debriefing session, Bob remarked that he found most of the in-class problems "real" and interesting. Watching himself on television allowed him to "see what [I] did", and the self-instruction training was of "some help .... it made my mind clearer whenever I have problems ... the way of handling [them]".

At the end of the summer holiday, approximately 12 weeks after completion of the program, the two Experimental group students were interviewed. The purpose of this follow-up was to determine how well the students remembered their training and if they had used the strategies in situations outside the classroom.

Alan could recall a number of strategies or their effect:

"not to speak out in class, learn the problem by asking questions, use past experience, try different ways to solve the problem, try to get the best answer, listen to others' answers."

When asked if he thought about the training, he replied "I don't think about them much...[but] they are in my mind." He attributed his recall of certain strategies to the repetition of their use in the self-instruction training sessions. He felt they might have had some practical use at his work but could not give a specific example.

Bob was also able to recall some of the strategies: "try to picture [the problem] in your mind, use experiences associated with the problem, try to think of alternatives and go through them to see if they fit, use paper....draw a picture." Bob said he could recall the "flow chart" of strategies and, given more time, would be able to remember most of them.

He reported that he had not thought a great deal about the strategies but had used them "lots of times... [they] work good." Bob gave an example of a financial problem he had been able to solve satisfactorily and described the training as helpful in solving practical problems. Both Alan and Bob reported they intended to return to school in the Fall in regular programs.

Discussion

This study was conceived as a pilot program which would evaluate the effectiveness of self-instruction training as an approach to cognitive behaviour modification. A number of innovations were introduced. Primary among these were 1) the application of self-instruction training with high-risk adolescents in an ongoing high school classroom setting, and 2) the use of videotape feedback to aid attention control and recall among the students. With regard to the study as a whole and to the specific innovations, a number of tentative conclusions were reached which suggest both confirmation of the predicted outcome and recommendations for increasing the effectiveness of the program in the future.

Support for Self-Instruction Training

Given the severe attrition of students during the study, particularly in the Experimental group, claims for the efficacy of the self-instruction training devised for this program can only be made with restraint. The changes in impulsive behaviour observed by both teachers and judges for the two remaining Experimental subjects may, of course, be due to chance factors. However, a number of results lend support to a claim for effectiveness: 1) changes were observed using two independent measures, 2) patterns of differences between Experimental and control subjects were consistent across measures during the later stages of the study, and 3) the Experimental subjects could recall many of the strategies taught to them and provided evidence of using the strategies during the problem-solving sessions and outside school. In short, the pattern of results suggests that the students who received self-instruction

training did learn to modify certain aspects of thinking in the direction of being more reflective.

The results for control subjects suggest that neither exposure to problem-solving activity in the classroom nor receiving feedback by viewing one's performance on videotape are sufficient to modify aspects of cognitive behaviour observed in this study. The student needs to be induced to analyse his thinking behaviour overtly and to replace dysfunctional strategies with more productive ones.

Though the use of the videotape feedback alone is not a sufficient condition to bring about wanted change, it is viewed as a powerful adjunct to the self-instruction training procedure. During the training episodes, the playback offered focal points for discussion and attention. Students heard exactly what was said by themselves and others and saw their exact actions. With the aid of the trainer, these objectively presented "self-statements" became the subject of analysis, invited the student to recognize deficient performance, and provided areas for engaging in relevant cognitions.

These claims are made with some caution because of the small number of students involved. A more credible test for the efficacy of the self-instruction training program developed for this study would have to come through replication with a larger population. There is an irony here, however, which should not be dismissed by future investigators. The high-risk, impulsive student is not always one to be around when most needed. Addressing their difficulties in voluntary programs is a bit like trying to teach children the value of nutrition in an environment that offers junk food at every turn.

Recommendations

A number of insights emerged from the study which are recommended for incorporation into future attempts to apply and evaluate self-instruction training in the classroom:

1. It is strongly recommended that the problem-solving activities and self-instruction training be built into the daily

curriculum rather than be an appendage to it. This integration may increase the perceived relevance of the problems by students and teacher, increase student interest and participation, and perhaps reduce attrition. The problem-solving activities could be embedded in, for example, life skills, social studies, or a language arts or literature curriculum. These curriculum areas would act as vehicles for problem solving in matters of content and students' emotional make-up. Negative feelings that affect temper and mood and thus self-control could also be addressed.

2. Individual self-instruction training in the typical classroom is likely not feasible, given the time that would be required of the teacher-trainer. It is recommended, therefore, that future study examine the effects of training in small groups. Other benefits may accrue in addition to saving time. For example, students may be less reluctant to demonstrate their knowledge of problem-solving strategies amongst their peers both in and outside the school if they have been directed to discuss and apply the strategies in group settings. To "stop and think" may not be such a bad idea among these students if the decision to do so is reached by consensus.

3. It has been frequently pointed out that approaches to cognitive behaviour modification ought not be conducted in isolation of the person's total environment if the desired goal of transfer is to occur (Coates and Thoresen, 1979; Ross and Fabiano, 1981). Coates and Thoreson have observed that attempts have rarely generalized to the natural environment, and argue for frequent opportunities to practise newly learned cognitive skills in many facets of a person's daily life. The present pilot study did not permit a multi-faceted approach. Ideally, parents, teachers, employers and other supervising adults should be aware of the intents of self-instruction and of the thinking strategies taught, and should provide opportunities for practice and corrective feedback on a continuous basis.

4. Should self-instruction training be incorporated into the curriculum by classroom teachers as recommended, their efforts may go the way of so many other failed attempts at educational

innovation. To guard against this potential for failure, it is recommended that teachers be fully trained in the conceptual bases for cognitive behaviour modification and in particular the application of self-instruction training.

Conclusion

A renowned Italian physician by the name of Cesare Lombroso was an active proponent of the school of criminal anthropology at the turn of the century. His work was typical of the day in that it attempted to provide a simple hereditary explanation for deviant, anti-social behaviour. His pronouncements, supported by no less an educator than Maria Montessori, implied that education or rehabilitation would do little to deter the hereditary throwbacks among the population from a life of disobedience or crime. Accordingly, he advocated that schools screen children in order to isolate those having a high risk of genetic inferiority. In 1911, Lombroso wrote:

> Anthropological examination, by pointing out the criminal type, the precocious development of the body, the lack of symmetry, the smallness of the head, and the exaggerated size of the face explains the scholastic and disciplinary shortcomings of children thus marked and permits them to be separated in time from their better-endowed companions and directed towards careers more suited to their temperament (In Gould, 1981, p.136).

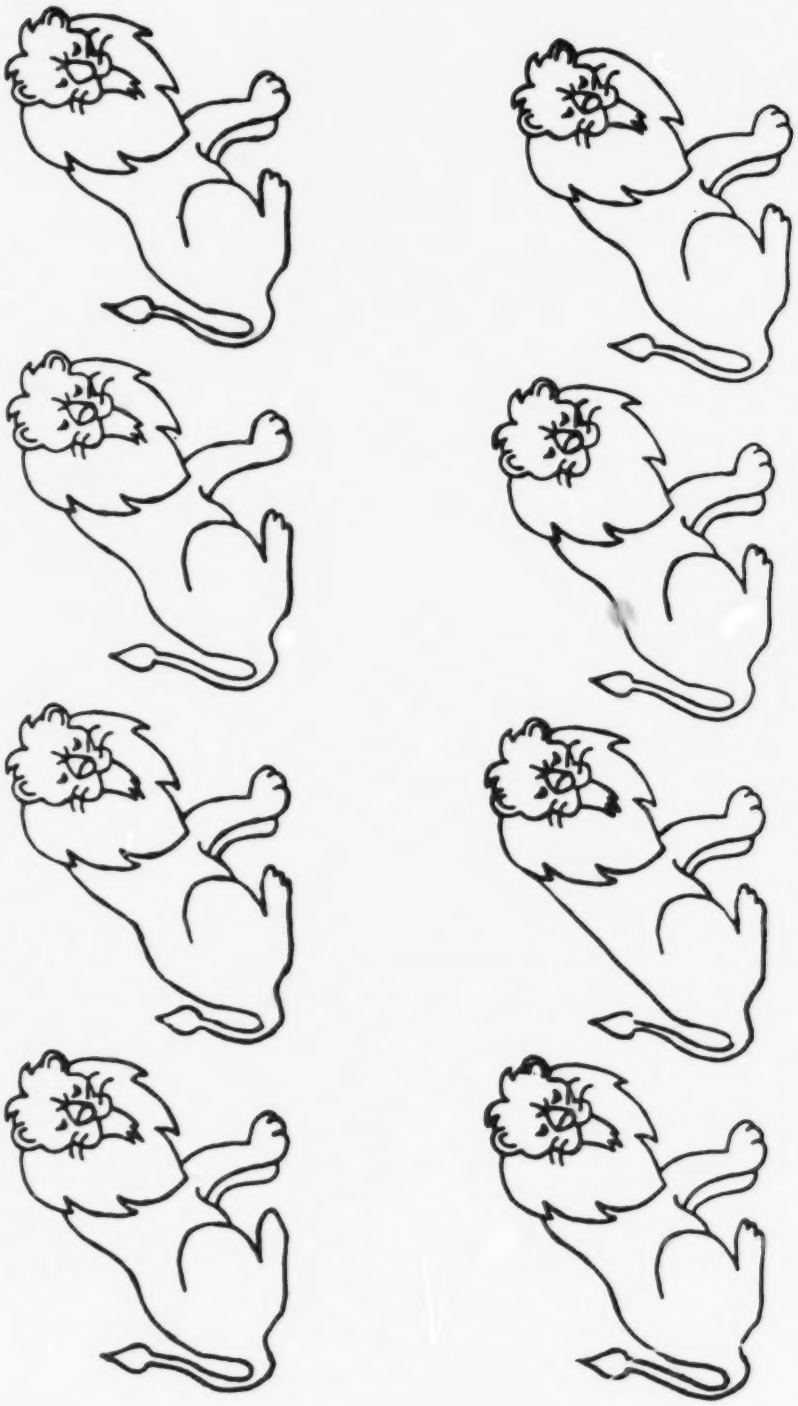
We understand better today that there is no such simple reason why we find persons at high risk in our society -- a complex mix of sociological, psychological, physiological, and genetic factors is involved. The evidence provided in this study and elsewhere argues that deficient or maladaptive learning is a major contributor to the sorts of thinking and behaviours that place a person at risk. Further evidence was provided which suggests that cognition and resulting behaviour are modifiable through means which teach persons to monitor their thinking processes in more effective ways.

In a very real sense, it is a central mission of education to help students increase the effectiveness of their cognitive processes and to attempt to modify those processes when judged

deficient. For the student at risk, this mission is all the more imperative.

Appendix A

Sample item from the
Matching Familiar Figures test



Appendix B

Consent Forms

FACULTY OF EDUCATION
DUNCAN McARTHUR HALL

STUDENT CONSENT FORM

Queen's University
Kingston, Canada
K7L 3N6

I, _____, agree to participate voluntarily in a research program at LCVI which is designed to enhance decision-making and learning skills of students. The research program has been approved by the Ontario Ministry of Education and the Frontenac County Board of Education and has passed an ethics review required by Queen's University at Kingston. The program will be conducted by members of the Faculty of Education, Queen's University and staff of LCVI during the period February through May 1982 and will require no more than two hours per week of my time.

I understand that video and audio taping of me will be conducted during the research and that all such tapes will be held in strictest confidence, solely for the use of the researcher and myself. I understand that all tapes produced will be completely erased no later than August 31, 1982.

I understand that any information gathered through my participation will be coded in such a way that I cannot be identified by persons outside the research team. I understand that I may withdraw from the program at any time.

Thank you.

Dr. Donald S. Campbell
Principal Investigator

Ken Fuller
Research Associate

NAME:_____

DATE:_____

SIGNED:_____

FACULTY OF EDUCATION
DUNCAN McARTHUR HALL

Queen's University
Kingston, Canada
K7L 3N6

Parental/Guardian Consent Form

I, the undersigned as parent or guardian of _____ consent to his/her voluntary participation in a research program at LCVI which is designed to enhance decision-making and learning skills. The research program has been approved by the Ontario Ministry of Education and the Frontenac County Board of Education and has passed an ethics review required by Queen's University at Kingston. The program will be conducted by members of the Faculty of Education, Queen's University and staff of LCVI during the period February through May 1982 and will require no more than two hours per week of the student's time.

I understand that information gathered through the participation of the student named above will be kept anonymous and that he or she may withdraw from the program at any time.
Thank you.

Dr. Donald S. Campbell
Principal Investigator

Name: _____
Date: _____
Signed: _____

Appendix C

Sample problem-solving tasks

The problem situations presented in the classroom can be categorized in four groups: 1) puzzle/math-type problems, 2) personal problems, 3) general social problems, and 4) fact-finding problems which could be personal or more general in scope.

1) Puzzle/Math problems: Students were given verbal information about the specific problem. They could write information down, use the blackboard, or have the instructor use the board, although this was not emphasized at each session. For example, a problem was described in which 10 identical-looking coins are present, one of which weighs slightly less than the others. A balance beam is described as available to be used to compare weights. The students must describe a method for finding the one light coin in a maximum of three weighings.

2) Personal problems: An attempt was made to personalize common life-skills problems. As an example, Diane was described as a young girl completing her third year of a community college course. Diane lived alone in her bachelor apartment, had moved away from home two years ago, and was completely independent. She was experiencing some financial difficulties in her last two months of school. She owed money for rent, could not get a student loan, and had no other means of support. She would graduate shortly, with good marks, and hoped to obtain full-time employment. She was not averse to part-time work and had done so the last two years, but felt that her average suffered. Students were asked to explore the alternatives available to Diane as well as their consequences, and to suggest a plan of action for her.

3) General social problems: These problems addressed social issues that students may not have previously encountered. For example, a local incident involving the death by exposure of a young student was explored. Newspaper reports were used as the main source of information. Students were asked to define the problem as outlined in the paper and as they saw it. Lack of reported information was discussed. The students were asked to sit as a coroner's jury to decide what solutions or recommen-

dations could realistically be made. These were compared to the solutions reported in the newspaper.

4) Fact-finding situations: The students were given a brief outline of a job situation in which they might be interested. In one example, an attractive part-time job advertisement described a sales position requiring a personal interview. Students were asked their opinions or impressions of the job. The instructor then role-played the part of the employer, and students were invited to ask questions to find the facts about the job. When this information was gathered, the students were again asked about their opinions or impressions of the job.

Appendix D

Self-control rating scale

BEHAVIOUR RATING SCALE

Form A

Name of Student _____

Teacher/Supervisor _____ Date _____

Please rate this student according to the description below by circling the appropriate number. The underlined 4 in the centre of each row represents where the average child would fall on this item. Please do not hesitate to use the entire range of possible ratings.

1.	When the student promises to do something, can you count on him or her to do it?	1	2	3	4	5	6	7	
		always						never	
2.	Can the student deliberately calm down when he or she is excited or all wound up?	1	2	3	4	5	6	7	
		yes						no	
3.	Is the quality of the student's work all about the same or does it vary a lot?	1	2	3	4	5	6	7	
		same						varies	
4.	Does the student work for long-range goals?	1	2	3	4	5	6	7	
		yes						no	
5.	When the student asks a question, does he or she wait for an answer, or jump to something else (e.g., a new question) before waiting for an answer.	1	2	3	4	5	6	7	
		waits						jumps	
6.	Does the student interrupt inappropriately in conversations?	1	2	3	4	5	6	7	
		waits						interrupts	
7.	Does the student stick to what he or she is doing until he or she is finished with it?	1	2	3	4	5	6	7	
		yes						no	
8.	Does the student follow the instructions of the teacher?	1	2	3	4	5	6	7	
		always						never	
9.	Does the student have to have everything right away?	1	2	3	4	5	6	7	
		no						yes	
10.	When the student has to wait (e.g., in line) does he or she do so patiently?	1	2	3	4	5	6	7	
		yes						no	

11.	Does the student sit still?	1 2 3 <u>4</u> 5 6 7 yes no
12.	Can the student follow suggestions of others in group work, or does he or she insist on imposing his or her own ideas?	1 2 3 <u>4</u> 5 6 7 able to follow imposes
13.	Does the student have to be reminded several times to do somethin before he or she does it?	1 2 3 <u>4</u> 5 6 7 never always
14.	When reprimanded, does the student answer back inappropriately?	1 2 3 <u>4</u> 5 6 7 never always
15.	Is the student accident prone?	1 2 3 <u>4</u> 5 6 7 no yes

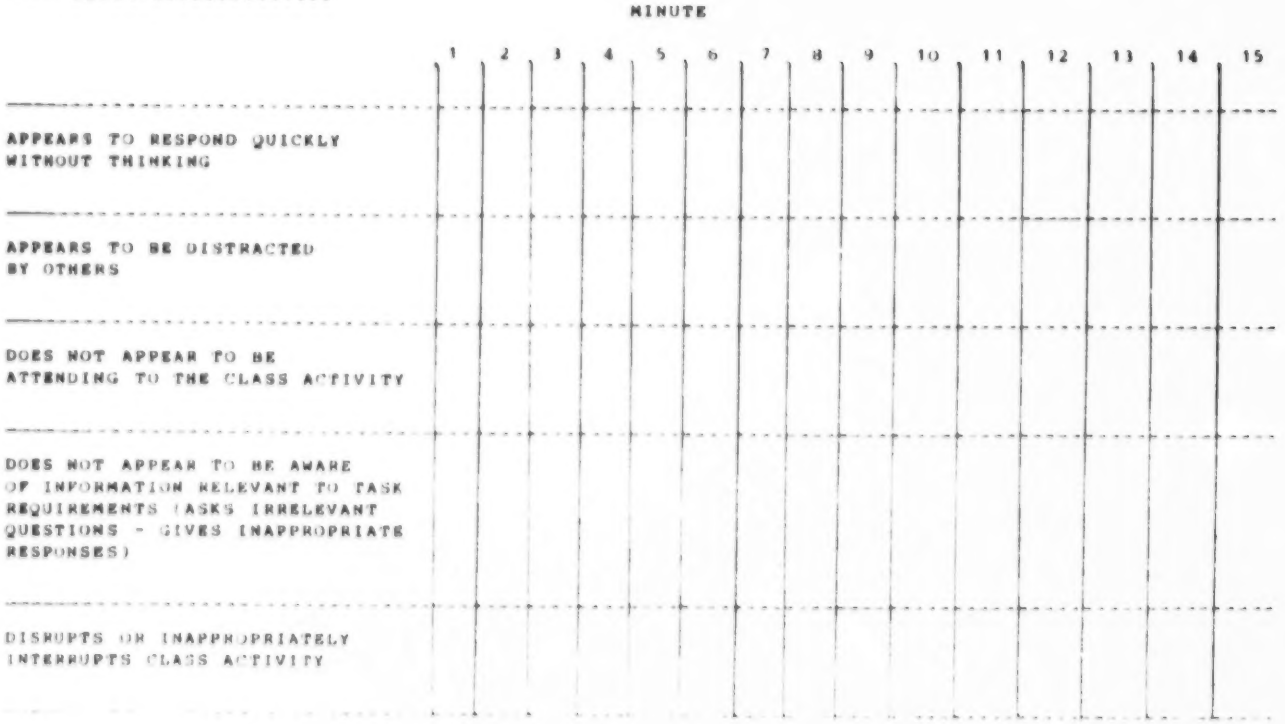
Appendix E

Judges' rating form

SUBJECT _____

RATER _____

DATE _____


MINUTE
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
APPEARS TO RESPOND QUICKLY WITHOUT THINKING
APPEARS TO BE DISTRACTED BY OTHERS
DOES NOT APPEAR TO BE ATTENDING TO THE CLASS ACTIVITY
DOES NOT APPEAR TO BE AWARE OF INFORMATION RELEVANT TO TASK REQUIREMENTS (ASKS IRRELEVANT QUESTIONS - GIVES INAPPROPRIATE RESPONSES)
DISRUPTS OR INAPPROPRIATELY INTERRUPTS CLASS ACTIVITY

Appendix F

Table 5: Data summary

Table 5: Data Summary

			MFF test		x SCRS[2]		Judges' Mean Ratings 3,4			
Subjects[1]	Age	Credits	Errors	x Lat.	Pre	Post	S1	S2	S3	S4
E2	17	9.5	14	15.5	56.5	34.0	0	4	15	0
E5	17	18	8	48.5	34.5	25.5	1	3	0	6
A1	17	18	10	25.2	34.0	34.5	6	7	23	25
A2	16	10	15	13.8	46.5	46.0	0	4	7	7
A3	17	13	13	19.9	56.5	65.0	0	16	27	10
A6	18	18	13	25.7	83.0	75.5	2	27	26	50
C1	18	18	10	16.2	55.0	48.5	3	1	11	11
C2	18	12	11	35.2	51.5	66.0	3	5	23	5
C3	18	12	14	13.7	59.5	53.0	0	0	18	8

1. Subject designations are: E = Experimental
   A = Attention Control
   C = Control
   Missing numbers are the result of subjects dropping out.

2. Rho coefficient of agreement between teacher raters:
   r(pre) = 0.60
   r(post) = 0.80

3. Ratings over four sessions, approximately one month apart.

4. Average rho coefficient of agreement between judges:
   r = 0.82

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